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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

RUTHKOSKY, MARK

ART UNIT	PAPER NUMBER
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1745

DATE MAILED: 03/10/2003

22

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary

Application N .

09/232,498

Applicant(s)

MIZUNO, SEIJI

Examiner

Mark Ruthkosky

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 December 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11 and 13-17 is/are pending in the application.
- 4a) Of the above claim(s) 14-17 is/are withdrawn from consideration.
- 5) ☐ Claim(s) 4 and 9 is/are allowed.
- 6) ☐ Claim(s) 1-3, 5-8, 10, 11 and 13 is/are rejected.
- 7) ☒ Claim(s) 1-3, 5-8, 10, 11 and 13 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Specification/New Matter

The amendment filed 12/11/2002 is objected to under 35 U.S.C. 132 because it introduces new matter into the disclosure. 35 U.S.C. 132 states that no amendment shall introduce new matter into the disclosure of the invention. The added material (in claims 1, 12, and 13) which is not supported by the original disclosure is as follows: the step of "charging the raw material into a predetermined mold at a temperature that is equal or less than a temperature at which the epoxy resin and the phenolic resin are carbonized" is not taught in the specification. The applicant argues that this step is taught in pages 18-19 of the specification; however, no temperature step is noted for the charging of raw material into a predetermined mold at a temperature that is equal or less than a temperature at which the epoxy resin and the phenolic resin are carbonized. There is no discussion of a temperature for the charging step. The specification does address temperatures for the heat-pressing step, however this is a separate step as shown in the claims and specification. In addition, the specification does not teach in any step a temperature range that is equal or less than a temperature at which the epoxy resin and the phenolic resin are carbonized.

Applicant is required to cancel the new matter in the reply to this Office Action.

Election/Restrictions

Newly submitted claims 14-17 are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: The original claims are to a

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method of manufacturing a separator while the newly added claims are to a separator for a fuel cell.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 14-17 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Claim Rejections - 35 U.S.C. § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 13 stands rejected under 35 U.S.C. 102(b) as being anticipated by Taylor (US 4,592,968.)

The instant claim is to a method of manufacturing a separator for a fuel cell comprising the steps of mixing a carbon, and a resin, charging the material into a mold, heat pressing the material and grinding a surface of the separator.

Taylor (US 4,592,968) teaches method of manufacturing a separator for a fuel cell comprising the steps of mixing a carbon, and a resin, charging the material into a mold, heat pressing the material and grinding a surface of the separator (see example 1, col. 8, lines 5-25.) The molding temperature in the example provided in col. 8 is 149 °C, which is in the range

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provided in the instant specification to be less than the carbonization temperature of the material.

Thus, the claim is anticipated.

Claim Rejections - 35 U.S.C. § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 3, 5-8 and 11 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Sandelli et al. (US 4,643,956), in view of JP 59042781.

The instant claims are to a method of manufacturing a separator for a fuel cell comprising the steps of mixing a carbon, an epoxy resin and a phenolic resin, charging the material into a mold and heat pressing the material.

Sandelli et al. (US 4,643,956) teaches a process for producing (col. 4 and examples) a separator plate for fuel cells which includes an electrode substrate and separator assembly where the process includes supplying materials into a mold comprising a carbon (carbon particles of 50 microns or less, see col. 3, lines 1-50), and a binder (can be phenol resins, including novolacs, see claim 3, col. 3-4 and examples.) While this process teaches the binder can be a mixture of phenolic resins, it does not teach a process for mixing phenolic resins and epoxy resins to form a separator (col. 20, line 10). JP 59042781 (abstract), however, teaches a method for producing a carbon material for a fuel cell comprising the steps of mixing a carbon powder, an epoxy resin and a phenolic resin, charging the material into a mold and heat pressing the material. The specific example shows a paravinylphenol polymer (phenol) and a novolak type phenol resin

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initial condensate having an epoxy group (epoxy) added to graphite powder. Novolac phenol resins are disclosed. The carbon is graphite less than 100 microns in size. The loading of the material is done at a temperature that is in the range provided in the instant specification to be less than the carbonization temperature of the material.

It would be obvious to one skilled in the art at the time the invention was made to use the molding composition presented in JP 59042781 as the binder of Sandelli et al. (US 4,643,956) as the materials are shown to bind the carbon into a sturdy, conductive plate for fuel cell applications. JP 59042781 teaches the plate with this binder has improved chemical resistance, heat resistance and gas impermeability, which are features desirable for such a separator. The use of such carbonaceous plates as separators is well known in fuel cell assemblies.

As the epoxy resin is reacted with the phenolic resin, one of ordinary skill in the art would have the knowledge to choose to react the functional groups in about a 1:1 stoichiometry as the reaction will go to completion and form the desired product. It is also obvious to one of ordinary skill in the art to use cresol novolak and bisphenol A type epoxy resins as the epoxy resin binder in a fuel cell; and resol phenolic resins as the phenol resin binder in a fuel cell. These specific resins are commonly used in the art as binders (see Hasegawa US 4,369,238, claim 2; and Sugaya US 5,128,378, col. 4, lines 60+ as examples.) for polymeric separators in electrochemical devices.

Claims 1, 3, 5-8 and 11 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Sandelli et al. (US 4,643,956), in view of JP 08-151,461.

Sandelli et al. (US 4,643,956) teaches a process for producing (col. 4 and examples) a separator plate for fuel cells which includes an electrode substrate and separator assembly where the process includes supplying materials into a mold comprising a carbon (carbon particles of 50 microns or less, see col. 3, lines 1-50), and a binder (can be phenol resins, including novolacs, see claim 3, col. 3-4 and examples.) The mold-pressing step is done at 300 °C (example.) While

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this process teaches the binder can be a mixture of phenolic resins, it does not teach a process for mixing phenolic resins and epoxy resins to form a separator (col. 20, line 10). JP 08-151,461 teaches a process for producing a plate for fuel cells where the process includes supplying materials into a mold, wherein the materials comprise carbon (carbon particles of 5-25 microns are shown in paragraph 12), and a binder of phenolic and epoxy resins, to form a plate (can be phenol resins, including novolacs, see p. 13-16.) The amount of epoxy relative to the phenolic resin is 5-50%, which falls in the range of 1:1 (p. 33). Compression molding with heat is disclosed in p 29. The loading of the material is done at a temperature that is in the range provided in the instant specification to be less than the carbonization temperature of the material (see paragraphs 13-18 of JP '461).

It would be obvious to one skilled in the art at the time the invention was made to use the molding composition presented in JP 08-151,461 as the binder of Sandelli et al. (US 4,643,956) as the materials are shown to bind carbon into a smooth, porous conductive plate for fuel cell applications. The JP 08-151,461 teaches the plate has improved smoothness and porosity using the method and binder described. One of ordinary skill in the art would have the knowledge to use of such carbonaceous plates as separators for in fuel cell assemblies as the plates will provide desirable characteristics known in the art for such fuel cell stacks.

Claim 10 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Sandelli et al. (US 4,643,956), in view of JP 08-151,461 and further in view of Taylor (US 4,592,968).

The teachings of Sandelli et al. (US 4,643,956) and JP 08-151,461 have been previously described. The loading of the material is done at a temperature that is in the range provided in the instant specification to be less than the carbonization temperature of the material. The references do not teach the grinding of the fuel cell plates in order to remove the surface layer that is in contact with the mold. Taylor (US 4,592,968), however, teaches method of manufacturing a separator for a fuel cell comprising the steps of mixing a carbon, and a resin,

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charging the material into a mold, heat pressing the material and grinding a surface of the separator (see example 1, col. 8, lines 5-25.) The molding temperature in the example provided in col. 8 is 149 °C, which is in the range provided in the instant specification to be less than the carbonization temperature of the material. It would be obvious to one skilled in the art at the time the invention was made to grind the surface layer of the plate in order to remove impurities from the surfaces and provide a uniform thickness. One of ordinary skill in the art has the knowledge to grind the surface as taught by Taylor.

Allowable Subject Matter

Claims 4 and 9 are allowed.

The following is an examiner's statement of reasons for allowance:

With regard to claim 4, which is to a method of manufacturing a separator for a fuel cell comprising the steps of mixing a carbon, and a resin, charging the material into a mold, heat pressing the material and grinding a surface of the separator. The claim includes the limitation of glycidylamine as the epoxy resin. The most pertinent prior art has been noted in the claims. The prior art does not teach this method including glycidylamine as the epoxy resin of the separator.

With regard to claim 9, which is to a method of manufacturing a separator for a fuel cell comprising the steps of mixing a carbon, and a resin, charging the material into a mold, heat pressing the material and grinding a surface of the separator. The method step includes preparing a slurry with resin particles with specific sizes and particle size distributions that are prepared by spraying and drying the slurry. The most pertinent prior art has been noted in the claims. The prior art does not teach this method including the step of preparing a slurry with resin

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particles with specific sizes and particle size distributions which are accomplished by spraying and drying the slurry. Thus, these claims are allowed.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Response to Arguments

Applicant's arguments filed 9/6/2002 have been fully considered but they are not persuasive. It is noted that the applicant's addition of the limitation of "charging the raw material into a predetermined mold at a temperature that is equal or less than a temperature at which the epoxy resin and the phenolic resin are carbonized" is not taught in the specification.

With regard to the rejection under 35 U.S.C. 102 over Taylor, the applicant argues that Taylor teaches carbonizing the separator material. It is noted that this is not done during the heat-pressing step as claimed. In fact, Taylor (US 4,592,968) teaches method of manufacturing a separator for a fuel cell where the molding temperature in the example provided in col. 8 is 149 °C, which is in the range provided in the instant specification to be less than the carbonization temperature of the material.

With regard to the rejection under 35 U.S.C. 103 with regard to Sandenelli (US 4,643,956), JP 59042781, and JP 08-151,461, the applicant argues that a 1:1 stoichiometry of reactants is not supported. The applicant does not persuasively argue that this ratio would not be obvious to one of ordinary skill in the art. The applicant further does not provide unexpected

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results for the claimed range of 0.8 to 1.2. The supporting reference, JP '461, does show a ratio of epoxy relative to the phenolic resin is 5-50%, which falls in the range of 1:1 (p. 33). Further, one of ordinary skill in the art would understand that for a reaction to go to completion the proper stoichiometry of reactions would be necessary and in this example, a 1:1 ration would provide a complete reaction between the resins.

With regard to the applicant's arguments that the references do not teach the applicant's addition of the limitation of "charging the raw material into a predetermined mold at a temperature that is equal or less than a temperature at which the epoxy resin and the phenolic resin are carbonized," it is noted that the temperatures during the pressing step are in the range of 140-220 °C as noted in the references. In Taylor, the mold pressing is provided at 300 °F or 149 °C. Sandenelli, the mold pressing is provided at 300 °F or 149 °C. JP '461 teaches pressing at 170 °C in p. 40. JP '461 teaches pressing at 200 °C followed by heating to a range of 220-270 °C in the abstract. Further, it is noted that any further heat treatment is not precluded from the process by the instant claims as written.

As such, the arguments filed 9/6/2002 have been fully considered but they are not persuasive and the claim rejections stand.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after

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the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Examiner Correspondence

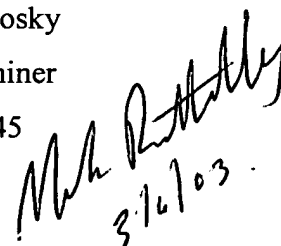
Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-1193. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mark Ruthkosky whose telephone number is 703-305-0587. The examiner can normally be reached on FLEX schedule (generally, Monday-Thursday from 9:00-6:00.) If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached at 703-308-2383.

The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Mark Ruthkosky

Patent Examiner

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3/16/03